

# **Research and Development of an 3D Stereo Imagery as a Tool for Access Permit Management**

*ADAM (Automated Driveway Access Management) System*

Presented by Joel Hearne

# *Presentation Outline*



- Vision
- Research Findings
- Technologies Prototyped
- Technologies Used

## Vision



*To develop  
an  
automated  
highway  
driveway  
access  
permitting  
system that  
includes a 3D  
imagery  
viewer and  
GIS interface*

Opening The Mind's Eye To Stereo Imagery

# *Research Findings*

## **GIS Technologies Researched and Developed for Access Management Purposes**

- **Desktop GIS**
  - Custom Automated Land-Use Analysis
  - Integrated Systems
- **Web-Based GIS**
  - Inter-Agency Coordination
  - Mass Distribution of Spatial Data
- **Stereo GIS Data and 3D GIS**
  - Stereo GIS System
  - Digital Elevation and Landuse Models
  - 3D Visualization
- **Modeling the Right-of-Way**
  - Three GIS Basemaps
  - 3D Imagery via the Web
  - Identification of Regional "Hot-Spots" for Land-Use Change
  - Emerging Trends in GIS Data Standards and Warehouses

## *Research Findings*

### **Paradigms for Spatially Modeling Transportation Networks**

- **Linear Networks GIS**
  - Linear Referencing Along Routes
  - Roadways and Mileposts
  - Direction and Volume of Traffic Flow
- **Cadastral GIS**
  - Public Property Ownership Boundaries, Survey, Tax Assessment
  - Ubiquity of GIS Driving Trends Towards Standardization
  - Direction and Volume of Traffic Flow
- **Physical GIS**
  - Measuring 3-Dimensions from the Sky
  - Elevation Models
  - Visual-Simulations Affect High-Level Decision Making





# Research Findings

## Cadastral GIS – Land-Use and Ownership

- Requires cooperation between local, state, and federal governments
- Useful for Trip Generation and Future Land-Use Considerations
- Means of Linking Permits with Property Data



Before

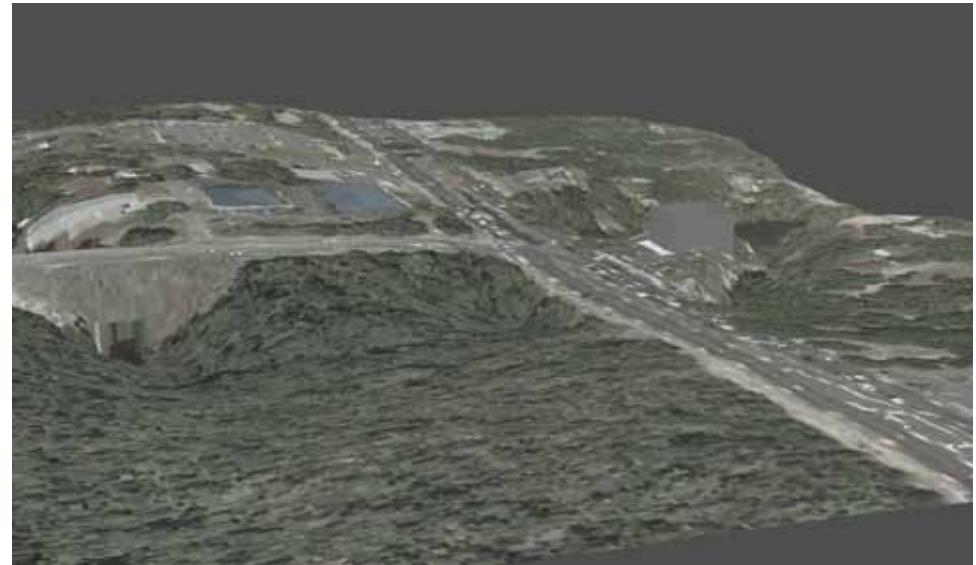
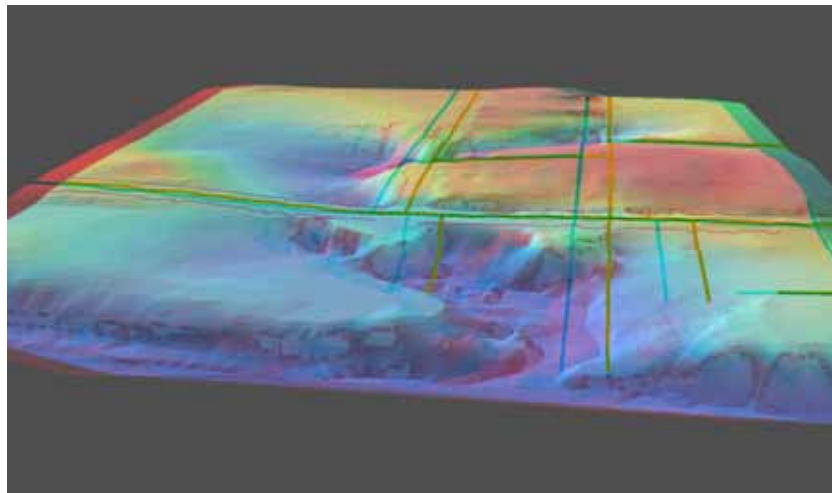


After

# Research Findings

## Physical GIS – 3D Modeling and Visualization

- Stereo (3D) Satellite and Aerial Photography
- Digital Elevation Models
- 3D Visualization



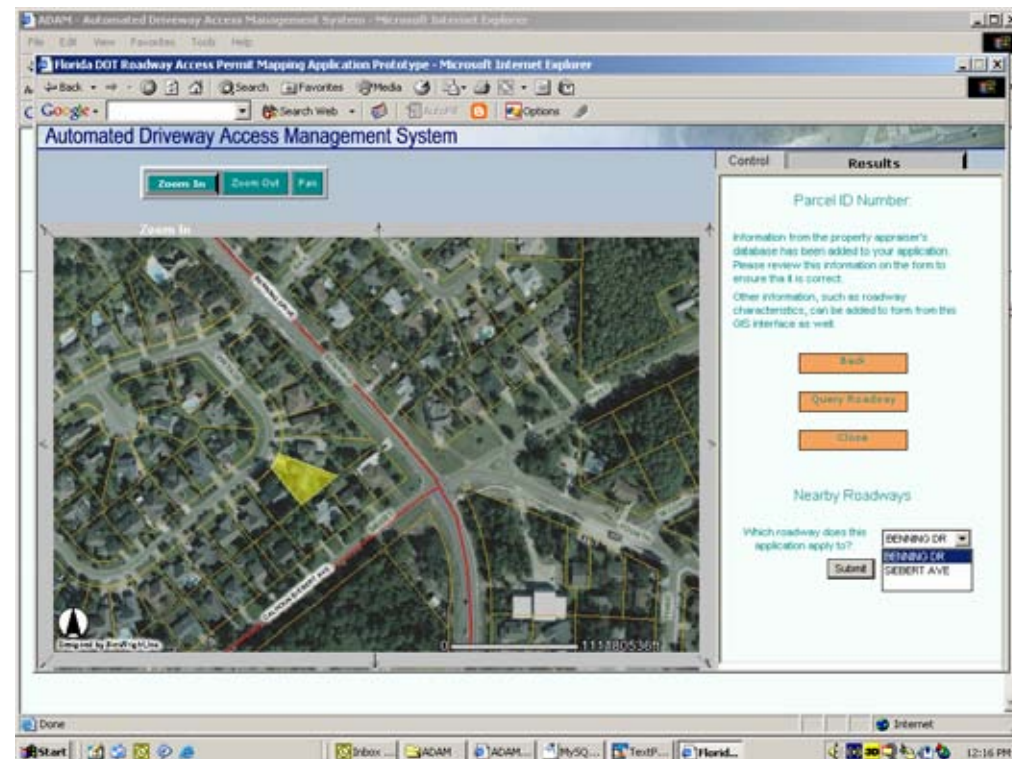


# Technologies Prototyped

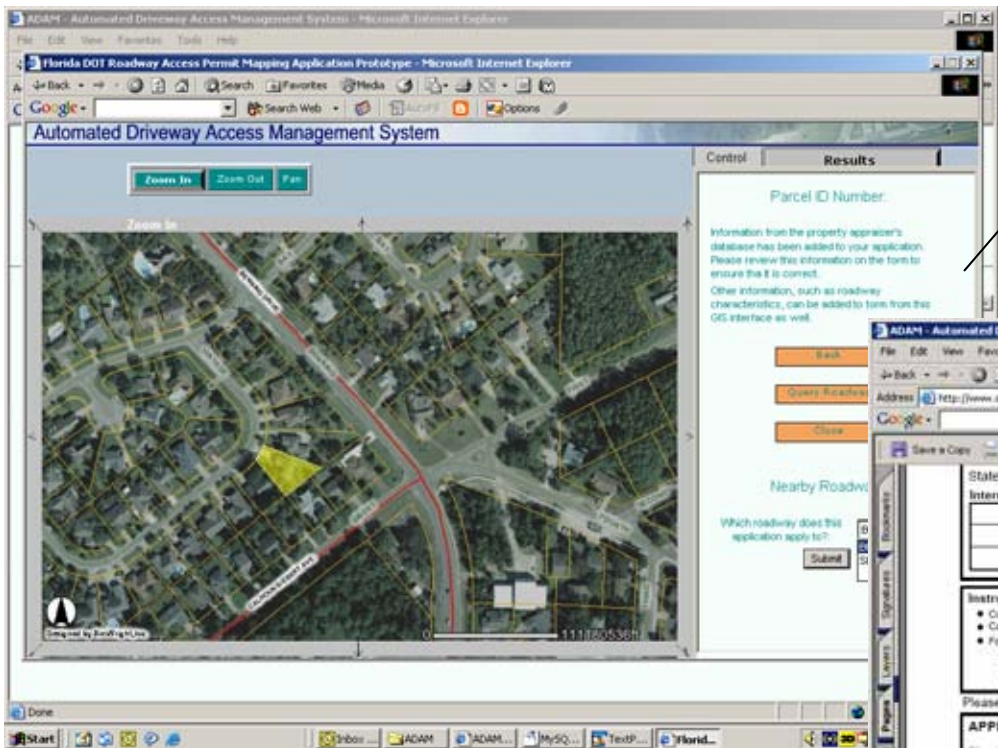
## Automated Driveway and Access Management (ADAM) System

### Web-Based Permit Application Forms

- GIS Enabled Forms
- Completes PDF Document
- Uses Stereo Imagery

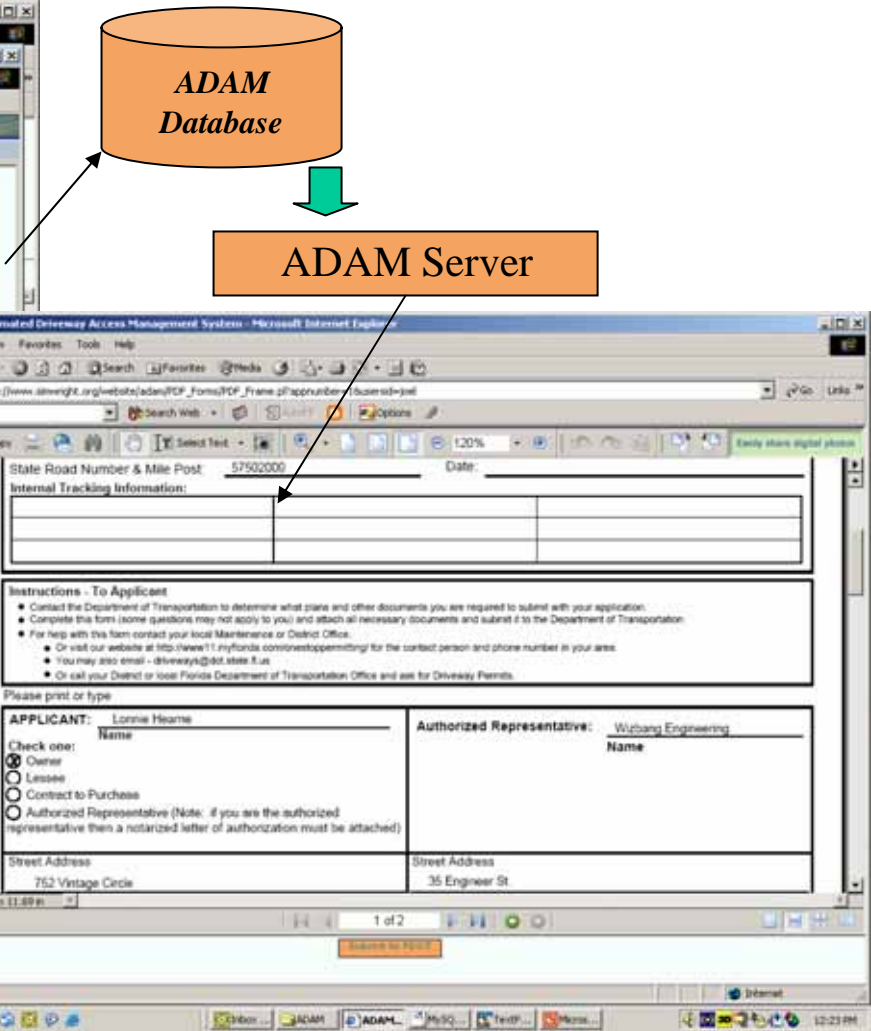


# Technologies Prototyped



## Automated Form Completion

GIS interface is used to establish geo-spatial reference for permit application. GIS analysis can then be used to identify nearby features such as roadways and mileposts that can subsequently be used to fill out portions of the application form.



# Technologies Prototyped

Step 1 - Step 2 - Step 3 - Step 4 - Step 5 - Step 6 - Step 7

Fill out application form manually

Application Form

Enter form data from map

Application Map

Information

Applicant Name:	<input type="text"/>
Applicant Type:	<input type="text"/>
Address:	<input type="text"/>
Address 2:	<input type="text"/>
City:	<input type="text"/>
State:	<input type="text"/>
Zip:	<input type="text"/>
Phone:	<input type="text"/>
Mobile:	<input type="text"/>
Email:	<input type="text"/>

<-- Back Next -->

Automated Driveway Access Management System

Zoom In
Zoom Out
Pan

Identify



Control

Results

Search Property Database

The property database can be searched by entering the owner name, site address, or parcel identification number (PIN). The option to add property information such as site address and owner name to the permit application will be presented when a single property is selected.

Owner Name:

Parcel Address:

Parcel Number:

Search

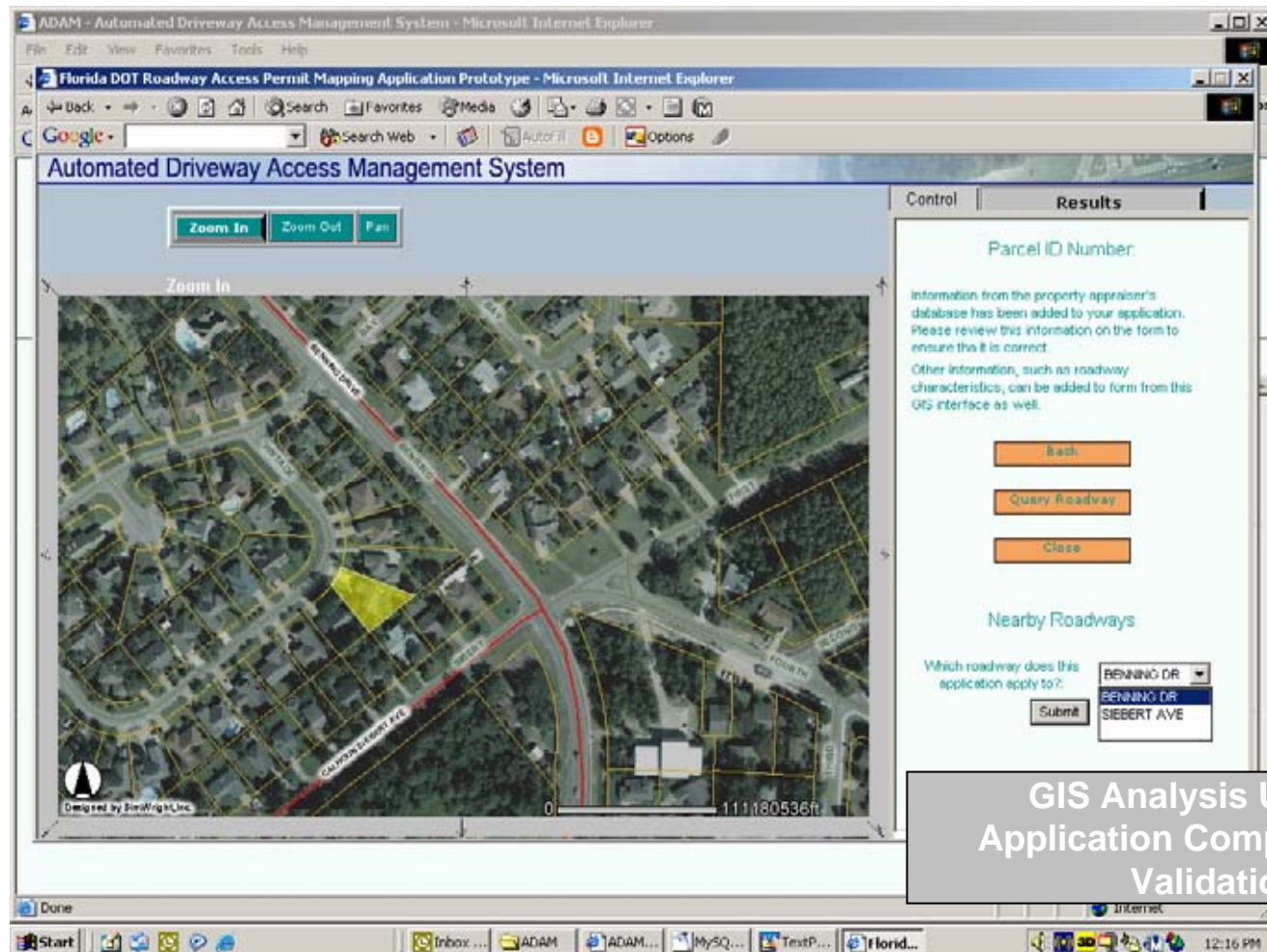
Don't know property data? Search Roads

Roads Search

Fill out form from traditional HTML form interface or from GIS interface



# Technologies Prototyped



# Technologies Prototyped

Application Process Complete.  
Let's review what we have before sending it off.

Retrieve Form

Microsoft Internet Explorer

57030000 Date: \_\_\_\_\_

Instructions - To Applicant

- Contact the Department of Transportation to determine what plans and other documents you are required to submit with your application.
- Complete this form (some questions may not apply to you) and attach all necessary documents and submit it to the Department of Transportation.
- For help with this form contact your local Maintenance or District Office.
  - Or visit our website at <http://www11.myflorida.com/onestoppermitting/> for the contact person and phone number in your area.
  - You may also email - [driveways@dot.state.fl.us](mailto:driveways@dot.state.fl.us)
  - Or call your District or local Florida Department of Transportation Office and ask for Driveway Permits.

Please print or type

<b>APPLICANT:</b> <u>SUNSHINE JR STORES INC.</u> Name Check one: <input checked="" type="radio"/> Owner <input type="radio"/> Lessee <input type="radio"/> Contract to Purchase <input type="radio"/> Authorized Representative (Note: if you are the authorized representative then a notarized letter of authorization must be attached) Street Address <u>456 Junior Store Road</u> Street Address (continued) <u>Suite 21</u> City, State <u>Atlanta</u> <u>GA</u>	<b>Authorized Representative:</b> <u>Choctaw Engineering</u> Name <b>Ready for submission !</b> Street Address <u>35 Engineer St.</u> Street Address (continued)  City, State <u>Fort Walton Beach</u> <u>FL</u>
--	--

8.26 x 11.69 in

1 of 2

Submit to FDOT

Done Internet



# Technologies Prototyped

- Site Plan
- Stereo View
- Parcel Map
- Milepost Map
- Email Applicant
- PDF Application

## Roadway Access Permit Application

Permit Year:	2004	Application Number:	1
Date Received:	Sun Jul 18 21:59:18 2004		
Fee:	not collected	Receipt Number:	NA

Status:	Newly Submitted	Date of Last Status Change:	Sun Jul 18 21:59:18 2004
Land-Use:	COMMUNITY		
Applicant:	Kerry Christopher	Project Name:	Un-named
Address:	9344 Navarre Parkway	Address:	33 HWY 98
City:		City:	Destin
Zip:		State:	FL
Phone:		Zip:	32541
Agent:	Commercial	Phone:	(850)-939-8707
Firm:	Christopher Engineering	County:	Okaloosa
State Road:	Hwy 30	Roadway Section:	57030000
		Milepost End:	17.5
		Access Management Class:	4

Reviewer Module is an information portal for permit application forms, property databases, roadway databases, and online map interfaces.

Modify Records



# Technologies Prototyped


Florida DOT Roadway Access Permit Mapping Application Prototype - Microsoft Internet Explorer

Automated Driveway Access Management System

Zoom InZoom OutPanIdentifyLegend

Map InsetEntire StateZoom LastPrint MapClear Selection

Zoom In



ControlResultsLayersHelp

Comment Information

Comment Id: 2

Application Number: 1

Comment: Potential for conflict from traffic in left turn lane on Hwy 9 8 and with ingress and egress from advacnt gas station.

Submitted By: Steve Jones

Date: 2004-03-21

Comment Menu

Close Map

Comments can be added along with digitized drawings as a communication aid

Access Management GIS Solutions

# Technologies Prototyped

Florida DOT Roadway Access Permit Mapping Application Prototype - Microsoft Internet Explorer

Back

Forward

Stop

Home

Search

Favorites

Media

Print

Close

Automated Driveway Access Management System

Zoom In

Zoom Out

Pan

Identify

Legend

Map Inset


Entire State

Zoom Last

Print Map

Clear Selection

Zoom In



Designed by SimWright LLC

17.642 17.642

61389779ft

Control

Results

Layers

Help

Property Summary

Parcel ID Number: 00-2S-22-0310-000A-0730

Owner Name

LEGENDARY DEV CORP

Site Address

33 HWY 98

Legal Description

CALHOUN S/D DESTIN COM SW COR LOT 73 BLK A 2ND REV OF CALHOUNS S/D N14 DEG E

Landuse Type

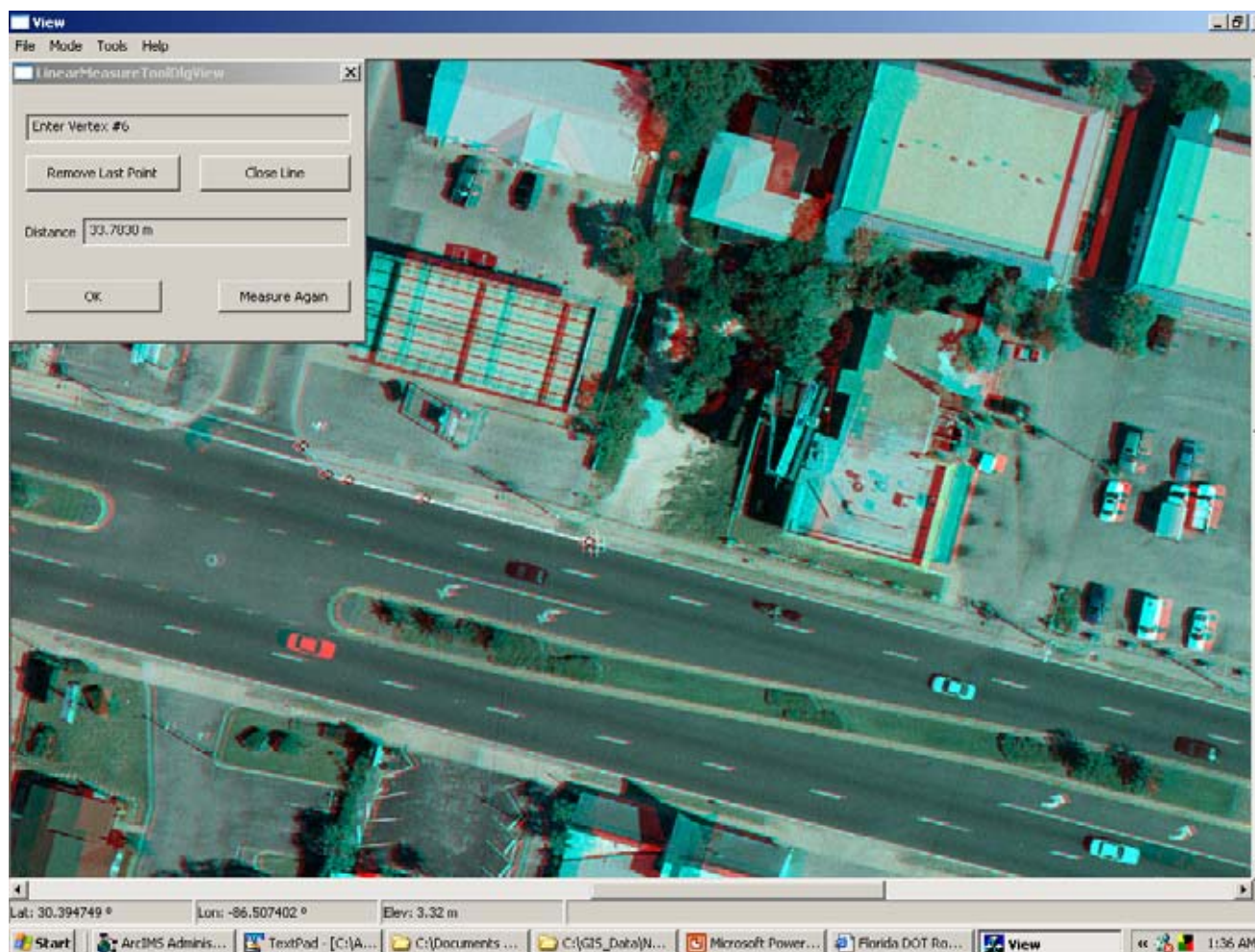
COMMUNITY

Cadastral Maps and Reports

Access Management GIS Solutions



# Technologies Prototyped



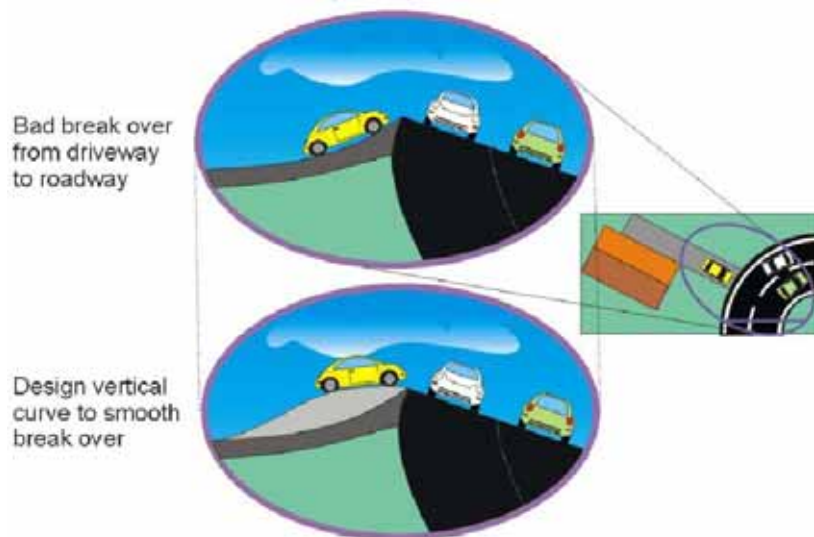
## Internet Stereo Viewer

- Serves Large Stereo Images Over the Web
- Allows for Mass Distribution of 3D Data
- Gives the User a Highly Precise, Geo-Referenced 3D View of the Site
- Capable of highly accurate planimetric and 3D measurements

# Technologies Prototyped

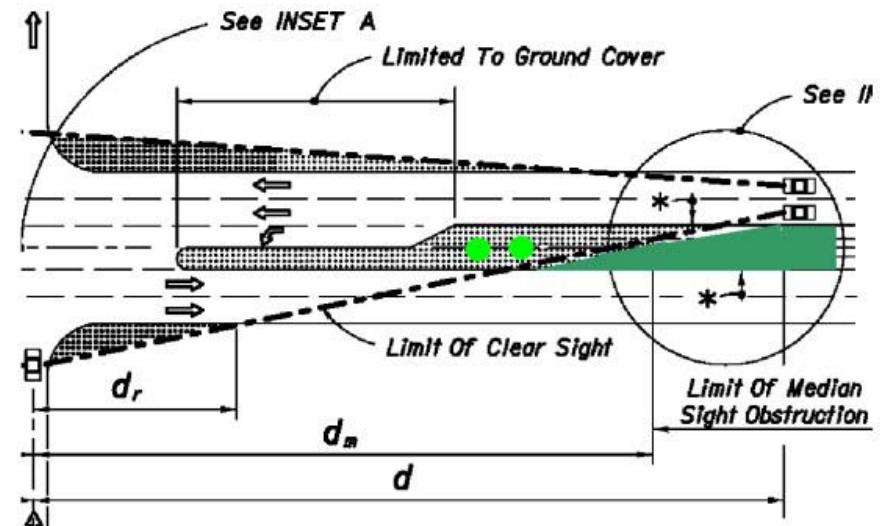
## Applications for Stereo in Driveway Analysis

### Driveway Grade Analysis



Source: Florida's Driveway Handbook Draft  
07/02/2003 (Super Elevation and Driveway  
Visibility)

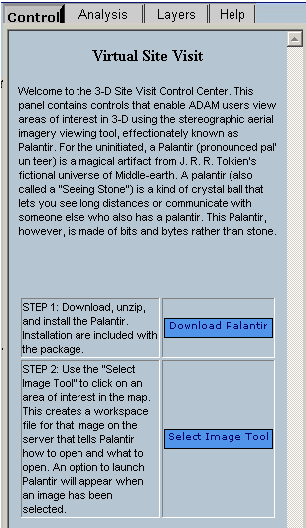
### Visibility - Line of Site



Source: Standard Index 546 (Sight Distance at Intersections)

# Technologies Prototyped

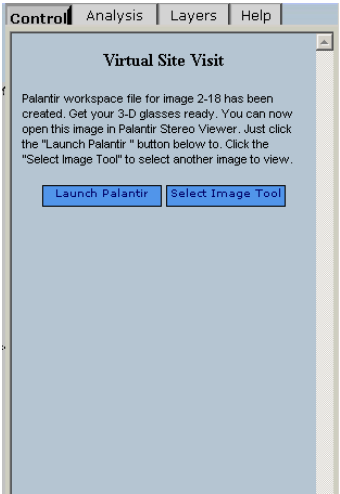
## 3D Viewer is standalone, but can also be controlled by ADAM



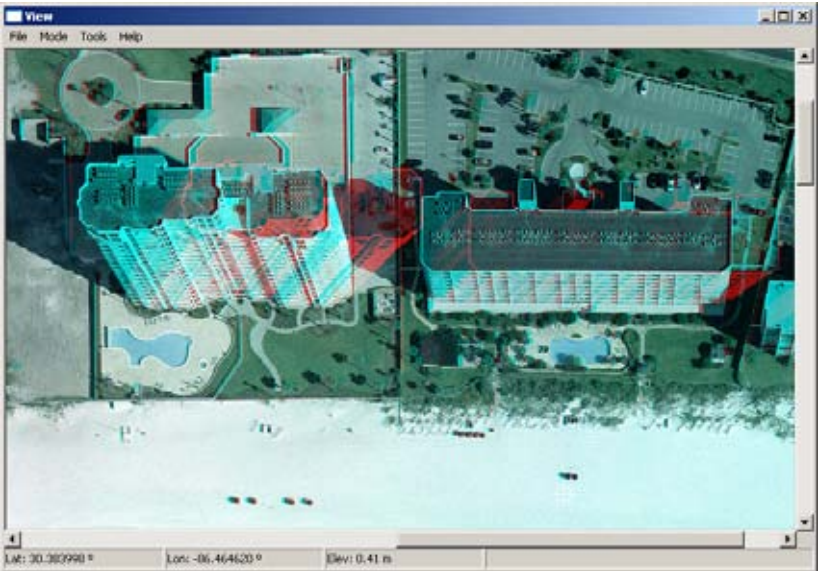
→  
User  
clicks  
map



→  
Launch  
3D  
Viewer



The first step to accessing 3D data is downloading and installing the software application. The user then uses the "Select Image" Tool to click on the area of interest on the map



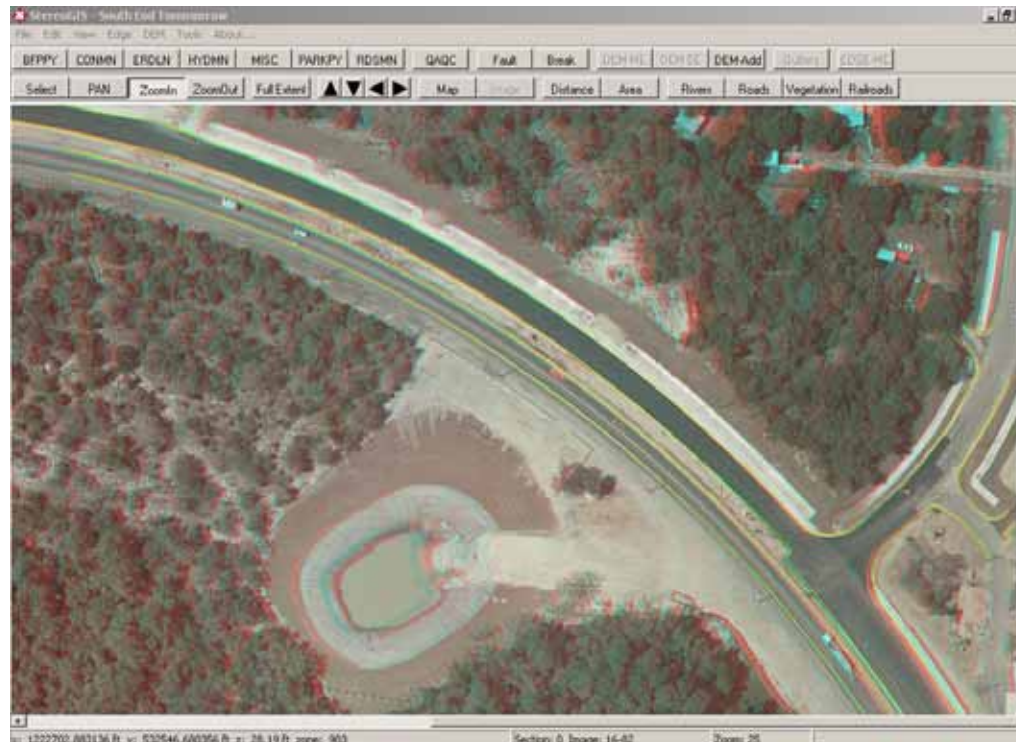
The user clicks "Launch Palantir" puts on his or her anaglyph or shuttle glasses and views the 3D imagery



## Technologies Used

### 3D Feature Extraction

- Stereo Imagery is used to extract precision GIS data such as curb-lines, parking lot boundaries, and elevation points that are useful for Access Management
- Feature's extracted from Stereo Imagery have been found to be accurate to within three centimeters

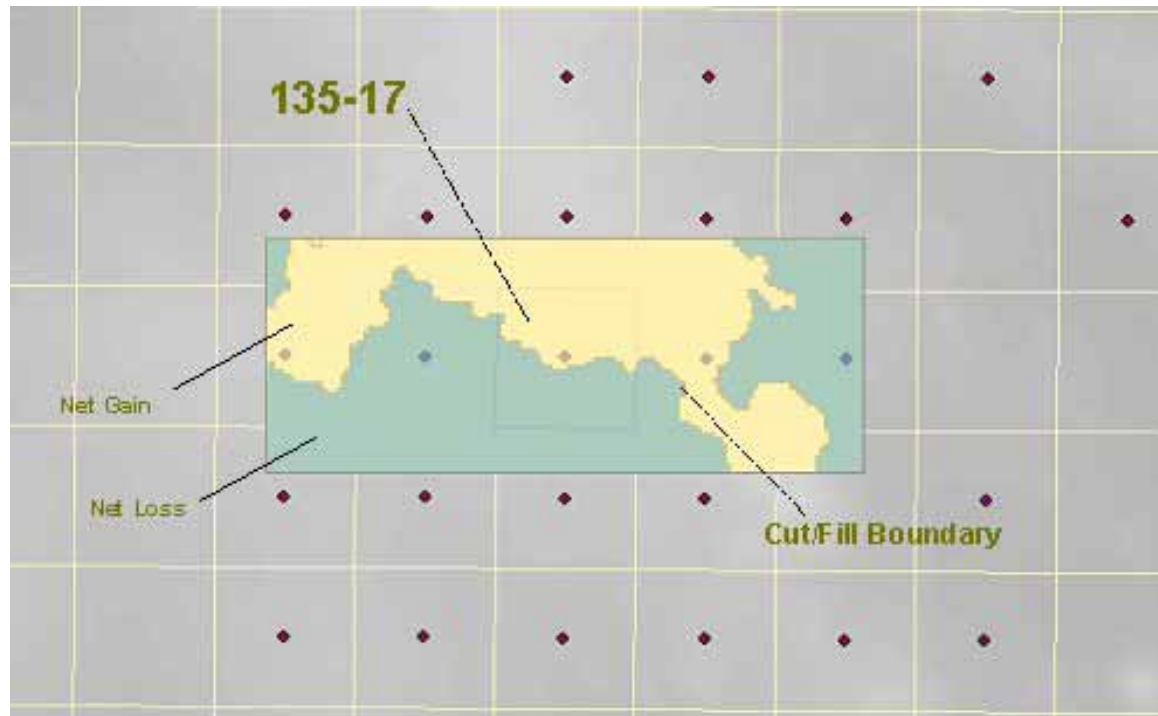




# Technologies Used

## Products Derived from Stereo Imagery

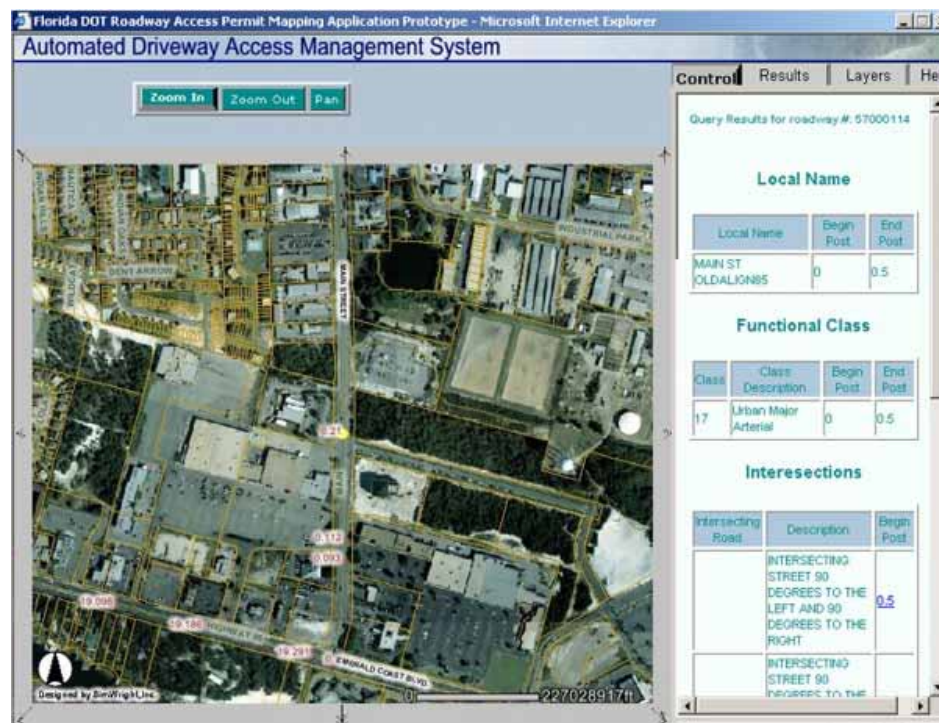
- SBIR Technologies have been used to solve volumetric engineering problems for Right-of-Way land acquisition and vehicle access
- Features such as elevation points, roadways, parking lots, building footprints, and cultural textures have been used to develop 3D visualization models for presentation to the public and land-use decision makers



# Technologies Used

## Web-GIS

- Custom GIS web-applications have been used to coordinate landuse decision making between regional planning teams
- Data sharing and inter-agency coordination has been realized via web-GIS customizations for county governments



## Contact Information

- Thank you !
- For more information about *ADAM* and other Web-based products, please contact us at:
  - [www.simwright.com](http://www.simwright.com)
  - [info@simwright.com](mailto:info@simwright.com)
  - (850) 939-8707